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Bulletin of the

Society for the Promotion of Engineering Education

VOL. X LANCASTER, PA., DECEMBER, 1919 No. 4

FOREWORD

I am greatly pleased with the manuscript of "Radio Engineering Principles" and recommend it as a work which brings the study of this important subject up to date. It covers fully and clearly without too great use of mathematics, the theory involved in the wonderful developments in the Art of Radio Communication made during the war, except for certain reservations which it is not possible to release at this time.

GEORGE O. SQUIER
Major General,
Chief Signal Officer of the Army

War Department,
Office of the Chief Signal Officer,
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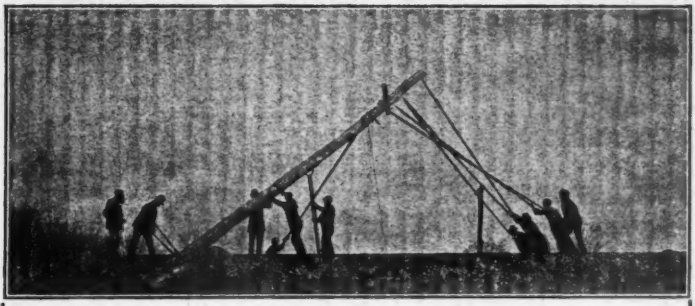

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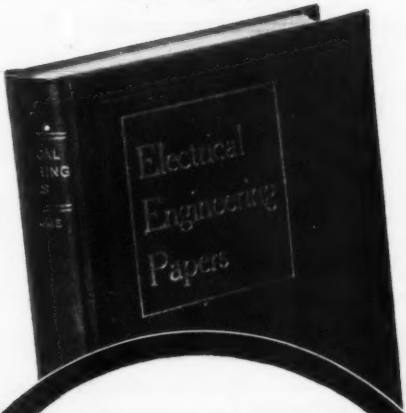

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PRESENT STATUS OF RESEARCH IN THE INDUSTRIAL LIFE OF THIS COUNTRY.*

BY C. F. HIRSHFELD.

The study of history reveals a great similarity in the social and economic conditions following wars of great magnitude. There is always a period of topsy-turvy-dom during which radicals of all kinds command large audience and during which individuals and nations act as though they had been relieved suddenly of all historical restrictions and bonds and were free to proceed unhampered in the pursuit of any sort of evolutionary or revolutionary scheme which met their individual or collective fancies.

This period always flows gradually into one in which the necessity of continuing an ordered social life is appreciated by the great majority, and the world, or that part of it effected by the war, settles down once more to the production of wealth and the pursuit of happiness upon a plane and according to methods not greatly different from those in use before the cataclysm.

The real lessons of the war and the lasting results thereof are seldom appreciated until they can be viewed in retrospect and often through a vista of many years.

The present situation bids fair to duplicate the past. We are apparently just emerging from topsy-turvy-dom into a more or less ordered existence. We are beginning to appreciate the fact that sociological surgery, like human surgery, has as yet certain limitations. We may perform operations of some sorts without seriously endangering a fairly normal patient but when the severity of the operation exceeds a certain limit the patient is apt to succumb to shock even after a most successful operation from the surgeon's viewpoint.

*Read at the Mid-West Sections Meeting, A. S. M. E., Indianapolis, Ind. October 25, 1919.

I feel that it is well to bear such facts in mind when discussing research and its application to industry in this country. There seems to be a popular impression that industrial research did not exist in these United States before the war, that the phenomenal performance of Germany and her allies was due to the development of such research in Germany, and that we are now about to take up work of this sort in characteristic American fashion, producing over night a dozen or more research laboratories for every one originally possessed by Germany. The facts are that industrial research was fairly common in this country before the war, that Germany's performance, in so far as it depended upon research, was largely based on the utilization of the results of research rather than upon the uncovering of new facts, and that to multiply research laboratories and facilities in this country at too rapid a rate would lead to chaos, waste and business failure instead of acting as a healthy stimulant to a slightly neurotic patient.

We must not expect the war to revolutionize over night our methods of producing and of doing business any more than we can expect it to suddenly "emancipate" labor. The fact that we are now trying to enunciate and codify principles governing the relations between employer and employee which have been in the process of development for decades should not lead us to attribute the principles themselves to the war. The disturbed conditions incident to the war merely serve to focus attention upon the problem. This is a convenient time for taking account of stock before we start out once more in ordered fashion to develop still further. Similarly, there has been growing in industry during the two decades just past an appreciation of the fact that refined methods of analysis produce results, and the war has simply served to focus attention upon the haphazard way in which industry has utilized and adopted such methods. This is unquestionably the time at which we can best study what we have achieved in the application of industrial research and at which we can best plan the future development in so far as it is controllable. If you will look over the papers which have been presented before this or-

ganization and others of similar type during the past three years you will discover that some of the best minds in the country are already engaged in just such a task.

There is another popular impression which I believe to be basically incorrect. Research is regarded as a name for the efforts of individuals who spend their working hours in physical and chemical laboratories delving into the so-called secrets of nature for the purpose of extracting hitherto hidden facts or formulas which may be expected to have commercial value. To me this is entirely too narrow an interpretation. I regard research as the search for facts and I regard industrial research as the quest for facts which have immediate industrial value. Research as now pictured by the multitude may be called material research. Industrial research must include many other varieties if it is to achieve its end, particularly economic research and sociological research. Questions of economic and sociological types are just as amenable to laboratory treatment as are problems in the proper method of heat treating a given grade of steel or in the modification required to take account of mass action in conducting chemical reactions on a commercial scale.

If research is regarded merely as the determination of facts, every department of industry is a proper field for research and can possibly be benefited thereby. In fact, if this definition be adopted, modern research is merely an organized or ordered development of the methods which have been in use for generations. Every executive and every individual in charge of industrial activities has had to make decisions and in so far as it was possible, has in general determined facts on which to base these decisions. Unfortunately the determination of facts in many different lines by one individual and at the rate required to keep pace with the evolution of the industrial world is impossible and as a consequence most of our successful executives have fulfilled Elbert Hubbard's definition—they decided quickly and were sometimes right. The marvel is that they were right in such a large proportion of their decisions.

All that we can hope to do by research is to make available for such men the facts upon which to base a greater proportion of their decisions. They will thus have to depend upon judgment, instinct, intuition, or guess, as you like, for a small proportion and their work will be just that much nearer to an absolute basis.

I do not like to pose as a prophet—I prefer to have some honor in my own country if it is obtainable. However, I believe it is patent that our industrial development on its material side is already out shipping the economic and sociological development required to stabilize it. We are learning to produce in greater quantities and in greater varieties daily and our attention is so focussed on this work that we are giving insufficient thought to the problems of finance, distribution and utilization and to the desires, ambitions and hopes which we are creating.

The literature of the day is so full of articles giving the results of investigations in the field of heat treating steel that no manufacturer of steel products can plead ignorance of the fact that exact information is available if he chooses to make use of it. On the other hand, where is that same manufacturer to learn the facts with respect to the advisability of making plant extensions during periods of rising as against falling prices, or during periods of decreasing business failures as against periods of increasing failures? Or where is he to determine facts with respect to the reasons why bonus systems succeed in some places and fail in others? Or where is he to obtain information with respect to the relationship existing between the rate of increase of wages in his plant or in his industry and the rate of increase of living costs? Research in such fields is conducted to a limited extent and certain publications are issued for the purpose of distributing the results but comparatively few industries seem to have recognized the necessity of applying this sort of research to the problems of industry.

Does it not appear that in the sudden public appreciation of the advantages to be gained from material research we are

threatened with a one-sided development which can only lead to trouble unless corrected at the start? Does it not appear desirable for organizations such as this Society to bring to the attention of the public the fact that no decision of any sort need rest on guess work if facilities for all the necessary types of research are available?

I am now concerned with the way in which research is to be conducted or financed. For my present purposes it is immaterial whether the federal government pays for this, the state government pays for that and the individual producers or a group of producers pay for something else. I am concerned with developing appreciation of the fact that what we now call research is merely an extension and refinement of methods previously in use, with driving home the fact that material research is only one of the numerous varieties required to continue the present industrial development, and with spreading the doctrine that it is good business to obtain such information as is necessary to enable our industrial executives to base their decisions more largely upon determined facts and to a lesser extent upon so-called judgment. I feel particularly that the continued stable development of the industrial age depends almost entirely upon our ability to bring to our executives those facts which will enable them to stabilize the social structure within which industrialism is contained and has its growth. I see no way of doing this other than by painstaking research along economic and sociologic lines and at such a rate as to keep pace with the results attained by the application of material research which industry itself may be depended upon to develop at an ever increasing rate.

I admit that my program is large—but the problem with which we are faced is large. Our country, in common with the rest of the civilized world, has developed to a point where the conditions we have created are leading us to question the adequacy and even the validity of what we have regarded as fundamental precepts in the relation of man to man and of nation to nation. Some of us attribute this condition to the rapid development of industry, others to the growth of social con-

sciousness and still others to the continued upward progress of man. Attribute it to what you will; it is a fact that parallel to our development of factories, modern methods of production and of ways and means of bending natural forces and laws to our ends there has occurred a development in human relations about which we have much less basic knowledge and over which we can exercise correspondingly less control. Is not a rather large program justified by such a set of conditions?

FRESHMAN ORIENTATION.

BY A. C. BAEBENROTH,

Professor of English, Syracuse University.

In 1916 the writer composed individual letters on the subject of a general informational course for freshmen in the Smith College of Applied Science at Syracuse University. These letters were sent out to a selected list of engineering school executives whose names appeared in the March, 1916, BULLETIN. The letters were not of the questionnaire type, but after a brief explanation of the idea in the mind of the writer, asked simply for information concerning the methods employed by the faculty of the engineering college in bringing freshmen in touch with college ideals. Forty-two letters were sent out.

Thirty-nine replies were received. Practically every one of these went somewhat into detailed explanation. Fourteen were accompanied by enclosures of booklets that were offered as concrete evidence of what was being attempted. These booklets are as a rule published by the university Y. M. C. A., or by an enterprising student or society. It developed upon analysis that in the majority of schools the attempt to bring freshmen into line was limited to a single lecture by the dean. Only four of the schools had elaborated on the introductory lectures given by the president and the dean. Moreover the course at Brown University is for the whole university rather than for the engineering college as a unit. Some of the titles noted below have been used at Brown. Purdue University has an excellent course of four required lectures on "Health and Efficiency in Your University Course." The University of Illinois has a more extensive course of lectures for freshmen, and the University of Idaho has a required series of eight matriculation lectures of a general nature.

Many of the letters revealed a sincere desire to accomplish something in the way of properly adjusting freshmen to their new environment. An equal number of deans stated frankly that although the need was great, nothing tangible had been done. A few spoke reminiscently of class advisory systems and other plans that had fallen into innocuous desuetude. "Several years ago an hour was set aside—unfortunately the practice has not been maintained." "Student conduct is regulated by the exactions of the individual professors." "For some time we have had in mind the giving of a course of lectures to freshmen—nothing definite has been done." "We are considering the introduction of lectures." "In the past more or less sporadic efforts have been made." "You will see that a good deal of this is pretty vague."

Because a very large number of those who took time to answer the letter fully, asked for the courtesy of a response in case a plan was worked out at Syracuse, the writer is using the present method of explaining the simple results of our experiments.

1. A course in "freshman orientation" was approved by the faculty in the spring of 1917. The work was to be conducted under the supervision of the department of English, with compulsory attendance for all freshmen. The course was scheduled to meet once each week. Students were alphabetically seated so that a cumbersome roll call was not necessary, the instructor taking the attendance after the lecture had begun. The attendance was uniformly good to the end of the course, the men showing no tendency to "cut." No doubt the caliber of the men who were invited to speak, explains in part at least the excellent attendance record. Close attention to details was encouraged by having it unobtrusively passed about among the men that an examination of some kind would be given at the conclusion of the course.

2. It was thought best to have two lectures at the very outset on "Right Living." In order to preserve the academic spirit, the creation of which it was one of the objects of the course to stimulate, it was finally decided not to have a medi-

cal man, but to invite one of our professors from the department of biology to explain the origin of life, at the same time leading by means of scientific exposition into the subject of sexual hygiene as a natural climax. Two lectures were devoted to the accomplishment of this: the first given over entirely to an elementary exposition of the evolution of life in the lower forms manifested in nature; the lecturer not as much as alluding to the matter of right living as applied directly to the student problem in the solution of which the lecture was to assist the freshman. As it turned out, the lecturer did not reach the purely human side of his subject until the last half hour of the second lecture. And it was not until the closing minutes that he spoke "straight-out" to the men about their social duties. The writer has listened to numerous lectures by "college doctors." He has several times invited a Y. M. C. A. secretary who was at the same time a physician, to lecture to his freshmen. But never has the quiet cumulative effect been so strong as in this instance. There was no room here for the near-salacious "side-lights" that undergraduates in certain institutions purposely go to enjoy in the lecture on such topics. All the authority of science was behind this lecture, and all the dignity that comes with honest exposition of such a subject went into the final and direct application to the freshman. The lecturer, of professorial rank, and a man with children in the adolescent stage, had his class of young men "sewed up tight" without once having had recourse to tricks of oratory or to the juggling of horrifying statistics.

Concerning this most important of all the topics in a course of orientation, the moral is clear. *First,* the lectures should be scheduled at the very beginning of the fall term, before the student has fallen into the temptation that is almost certain to come in some form to the youth who is for the first time, probably, separated from the restraining influences of home and tried friends. *Secondly,* as concerns the manner of presentation, the lecture should be leisurely and expository in tone. In order to have it so, a man from the faculty is the

best choice. A display of surgical monstrosities, together with a flaring account of the accompanying tortures, secures no practical results beyond possibly frightening the weak. The manly honesty and straightforwardness of biological elucidation appealed to the red-cheeked, straight-up-and-down, virile youths in our course, who would have resented an attempt to frighten them, but who allowed themselves to respond quickly to right knowledge.

3. Our dean gave the third lecture, "The Qualities of a Good Engineering Student." This at once served to give the men an idea of what would be expected of them during their four years at college. The dean as the head and forefront of the college can by means of such a discourse mold the plastic and willing mind according to his ideal of engineering.

The fourth lecture was given by the dean of the Teachers' College on "System in Study." Then followed a period devoted to the exposition of the "Honor System," which is in vogue in the engineering college, and concerning the merits of which representative seniors spoke, one from each of the coördinate departments. At another meeting of the course certain senior members of "Tau Beta Pi" explained the value of that society to the student body of the college.

The "Religious Life of the Student" and "Tobacco and Liquor" followed, as being practical in their application to the daily life of the men. Our professor of botany was willing to tell the men about their duties in the church. He, also, preferred the explanatory to the hortative style. The professor of economics gave an address on tobacco and liquor, and enlivened his statistics by direct appeal to the good judgment of each individual. In the matter of discussing the tobacco problem before students, it seems to the writer to be best policy simply to extend the line of thought opened up by President Hyde of Bowdoin College in a frequently printed "Address to Freshmen." His method is to warn and guide, and not to condemn.

4. Then followed two lectures that were intended to give the freshman a new slant on the value of his course in Eng-

lish: "The Value of English Composition" and "The Value of Public Speaking." As the head of our department of chemistry had collected valuable evidence of the relation between a graduate's ability to express himself and his chances of securing a good position, he was chosen to impress the class with the importance of the study of English. The diabolical subtlety of this choice will be appreciated when it is recalled that the freshman who is skeptical of the value of English in engineering does not suspect the professor of chemistry of prejudice on this subject. The moral is that a member of the science faculty will probably be more impressive than the professionally "interested" member of the literary faculty. The dean of our school of oratory gave a strong talk on public speaking. It is well at this point to emphasize the distinction between elocution and public speaking, because the engineer is not practically interested in elocution, and probably can not be interested even to the point of toleration. A man who is himself a model of the natural style of forceful platform address should be chosen for this important lecture. The head of our department of history lectured on "The Development of Style in Lincoln's Addresses." Our professor of Biblical languages and literature addressed the men on "The Origin of the English Bible."

One of the professors of the engineering faculty took the subject, "How to Read Technical Magazines," after which the professor of civil engineering lectured on "How to Utilize the First Vacation." This was not, as might have been expected, the last lecture, but was pushed ahead in the schedule in order to prepare the mind of the student, to give him abundant time for reflection, and also to forestall definite plans that might conflict with his best interests from the point of view of engineering. Specific ways were not suggested, but the underlying principles of success in engineering in so far as the proper utilization of the long vacation is involved, were clearly analyzed, so that the average student should have been in a position to help himself intelligently in his choice of

work. This plan avoids the paternal, straight-jacket method, and acts as a guiding force.

5. After this the head of our department of philosophy spoke on the theme "What is a University?" The direct application to the problem of the engineer lay in the proper orientation of engineering in relation to the other subjects taught in the university. "Factors of Success in College Life" followed, the points that were emphasized serving to elucidate still further the principles evolved in the preceding lecture.

In order that our men might secure their information about Syracuse University from authoritative sources, three lectures were given on the following interesting topics: "A History of the Campus," "Syracuse Customs," and "The Story of Syracuse Athletics." These more practical subjects naturally grew out of the general discussion of the immediately preceding lectures.

For "Syracuse Customs" we were fortunate to have available our Vice-Chancellor Emeritus, the only man connected with the university faculty who was present when his class was graduated in 1870. He has noted all the customs of the institution lovingly, and gave the men a talk they will never forget. Effective creation of the true spirit of *alma mater* can be accomplished by inviting a man of this type. The professor of architecture explained the physical growth of the university, at the same time calling attention to the architectural features to be enjoyed by the student. The subject of athletics was treated by the dean of our college of Liberal Arts, who was for many years a member of the board of stewards in charge of the Poughkeepsie Regatta, and the university representative on the intercollegiate board for the regulation of football. His experience not only gave him a command of the facts, but impressed the men with the importance of the reforms and true tendencies that should be encouraged if college athletics are to remain. Entertaining and fascinating as it was to have the early history of athletics unfolded, the lecturer did not consider it his mission merely to entertain.

By skilful grouping of material, and by apposite comment he drove home the lessons learned from the "athletic" mistakes of the past.

If these lectures helped the student to a more certain enjoyment of his university life, the concluding lectures assisted him in the intelligent appreciation of the countryside. The departments of botany, geology, and zoölogy can do a good service in freshman orientation by popularizing their technical lore in so far as it applies to the countryside adjacent to the campus. Contrary to the usual assumption, many undergraduates still are formidable walkers. If faculty members bemoan the degeneracy of the student body in this respect, it is probably because they are not on the road or in the field often enough to see the student taking his constitutional. And to those students who are inclined to remain shut in because they see no object in a country ramble, these lectures were a challenge: "The Birds of Onondaga County," "Neighborhood Geology," and "Wayside Plants and Flowers."

6. The following brief written examination was set at the last meeting of the course in May:

Name ten lectures given in this course. Characterize each in a sentence.

At this time, what lecture above all others seems most valuable to *you?*

Explain briefly in just what way this lecture has been of value to *you.*

7. Additional lectures for which speakers were available, but for which no time could be found, might be used in place of some of those given: "The Relation of Good Health to Success in Engineering" (this should be given by a man who is a model of physical and mental good health and who has been successful in engineering or executive work), "The Proper Illumination of Study Rooms," "The Human Element in Engineering," "If I were a Freshman Again," "Political Aspects of Engineering," "Law and Engineering," "Tau Beta Pi," "The Relation between Theoretical and Ap-

plied Mathematics," "What is History?", "The Relation between Culture and Engineering in the History of Mankind."

8. It will be noted that controversial or competitive subjects of the curriculum were with one exception avoided. A course that aimed to call attention to the merits of each field of engineering would sooner or later bring down upon itself the ridicule of the class. Professors would be misunderstood in their effort to give an impartial account of the virtues inherent in their "special" phase of engineering. The highest purpose of engineering will be most effectively served in such a course as this if the curriculum is avoided as much as possible; that is, if the curriculum is not directly discussed. An exception was made in the case of English because every professor of engineering knows, or should know, that the entering student is often antagonistic to first-year English, simply because he can not see its value or its bearing upon his engineering problems. The other and more fundamental preparatory subject, mathematics, needs no sustaining power of this kind because its value and immediate application are obvious even to the freshman.

9. The results of such a course are not sufficiently tangible to be measured. The full realization of its value can not come until several classes that have undergone the orientation treatment have graduated. It is not until we possess statistics covering a period of years that we can judge of the improvement the course has made in the morale of the student body.

10. One of the delightful features of the writer's experience with the first year of organization was the hearty and immediate coöperation he received from the members of other faculties of the university. Every member who was invited, consented immediately, even after it became clear in conference that a special angle was indispensable for effective treatment before an assembly of technical students.

It was the writer's method to introduce the speaker formally, presenting, as a part of the introduction, the facts of

the speaker's position in the university, and reading a list of some of the most important of his publications. Such an introduction emphasizes the dignity of the speaker and of the subject to be treated. And whereas the freshman is especially prone to faculty worship during the first half of his year, and although the authority of the whole university organization is behind the man who speaks, with the result that reverence is secured in that way—still, it is well for the student to know that the professor has done more than merely teach his weekly roster of lectures year after year. Except in the case of an unusually prominent man, the student can not be expected to know what has been published, for the reason that he is not in the habit of consulting the learned periodicals. To cultivate a proper respect for solid achievement is part of the work of freshman orientation.

DISCUSSION—ENGINEERING EDUCATION.

BY H. P. BOARDMAN,

Professor of Civil Engineering, University of Nevada.

The report on "Engineering Education" by Professor Charles R. Mann shows many reasons for our shortcomings and is replete with pertinent suggestions which ought to produce results.

It seems to the writer that one of the best lines of suggestion in the report is that dealing with methods of teaching. If a scientific subject can be made interesting to students by the introduction of practical applications, its scientific value need not be lowered and the student will work harder and learn more. On the other hand it is not likely that every necessary step in the development of subjects like mathematics, physics and chemistry can be illustrated by practical problems or applications. Some years ago the writer talked with a young mathematics instructor of a secondary school who was starting work on a thesis in which he hoped to show how to teach the essentials of algebra by using only "real problems," or those which have significance in actual life. He maintained that the average high-school girl gains nothing of value even in mental discipline from the study of abstract algebra, as usually taught and that it would mean something to her if it could be related to actual life problems. He confessed later on that he was having extreme difficulty in formulating enough "real problems" to illustrate all of the points he wished to bring out. One trouble with the "real problem" is that it is not made to fit one subject like elementary algebra but often involves several branches of learning, some of which the student may not be advanced enough to understand.

The writer will give a little of his experience with the surveying detachment of the Section B, S. A. T. C., October—

December, 1918, though it was no doubt very similar to the experience of many others. This detachment included several experienced surveyors, who coöperated willingly in helping to instruct the others. Approximately one half of the detachment had not completed a high-school course and one fourth not even the eighth grade. The field work included the following, in about the order given: Transit and tape traverse, leveling, triangulation, topography by stadia transit and plane table. These were followed by a limited amount of plotting, but the interest lagged somewhat at this stage as the armistice had been signed and numbers of the detachment had no intention of following surveying as a business. The writer considers the computations as the most difficult part of surveying for the novice, so endeavored to equip this class for that part of the work. The first instruction given was in the elements of trigonometry. Algebra and geometry were not taught except as required in developing the trigonometry. The solution of right-angled triangles was applied after a few days to computing the latitudes and departures of the traverse courses run in the field, the coördinate system being explained and at once applied. As soon as the solution of oblique triangles had been explained it was applied to computing the triangles whose angles had been read in the field.

Most of the members of the detachment spent from three to five evenings per week in a voluntary study session lasting one and a half hours, in one of the engineering buildings. Thanks to the assistance of the experienced surveyors of the detachment, all of the others were taught these computations by the use of logs and naturals. The subjects of trigonometry and surveying were neither of them covered at all completely but both were covered in the essentials of most common application. The formulæ used in computations were in the main developed before the class by the writer by gradual steps so that all should have been able to follow them through and understand them; *i.e.*, their lack of even high-school mathematics should not have prevented them from following the demonstrations through. Of course all did not actually under-

stand the work equally well and in fact several who had not completed high school gained a better understanding of the theory and computations than did one who stated he had been through calculus in college.

The writer would not, on account of the above experience, argue for admitting to his regular surveying course, students who have had no training in algebra, geometry or trigonometry. On the contrary, he considers it just as essential as ever to specify trigonometry as a prerequisite to surveying for engineering students. However, if more applications to surveying and other real engineering problems were used to illustrate the teaching of trigonometry perhaps the students would not have to "learn over" so much of that branch of mathematics as most of them now do when they attack surveying.

Surveying can usually be easily taught by doing actual practical surveying instead of merely by typical illustrative problems.

Some years ago before he took up teaching, the writer had an enlightening experience with two young engineers, graduates in civil engineering from a prominent state university in the Mississippi valley. They were sent out with the necessary equipment to tie in a group of buildings comprising a manufacturing plant and several houses, to the center line of a proposed canal, which center line they had assisted to stake out on the ground. They returned to the office with insufficient data to enable them to plot the buildings on a map of the canal line. What is more they did not seem to understand what other measurements were necessary until the writer went into the field and showed them. The writer believes, possibly erroneously, that this as the result of teaching surveying field work largely by means of detached problems intended to illustrate principles but not connected up into one comprehensive survey. At any rate in his twelve years of teaching experience, which was preceded by sixteen years of practical engineering work, the writer has always required his surveying classes to make actual field surveys of areas and compute and plot from their own notes. The results in general seem to

justify the method. All locations are not equally favorable for this method but it is probably possible of application in most institutions.

In small institutions like the one with which the writer is connected, it is not usually possible for the faculty members belonging to the strictly engineering departments, to have complete control of the teaching of nontechnical subjects to engineering students, one reason being that other than engineering students are often in the same classes with the engineers, the instructional force being too small to provide distinct sections for engineers.

Partly on account of this condition but more especially to try to hold up the interest of freshman and sophomore engineers and show them why they spend so much time on preliminaries, the writer introduced in 1918 a course for freshmen entitled "A General Survey of Civil Engineering." It has not yet been given on account of the war conditions last fall but will be offered next semester as an elective. The aim of the course will be to show many of the practical applications in engineering of such subjects as mathematics, English, physics, chemistry and geology. It will not be merely a popular (or unpopular) lecture course but will involve a considerable number of computations and will endeavor to convince students that they need to understand much of the above subjects in order to be properly equipped for the later technical courses and for independent study along special lines in connection with the practice of engineering.

The writer has for a number of years given a course in current engineering literature. This has consisted of assigned readings and discussions from current engineering periodicals and technical society proceedings. The student is required to prepare his assignment, so he can give the gist of it orally, with the aid of brief notes if he wishes, explaining the illustrations if any, and discussing any controversial points.

The assignments are so made that each student will occupy from one half to a full hour period when his turn comes. It is a one credit course per semester and if there are more than

four or five students in the class they meet for two periods per week so that each one will come on the program about once in every two weeks.

This was for some years made a requirement for senior civil engineering students, the idea being that they would get more out of the course than less advanced students, but recently it was made an underclass course, elective for freshmen and sophomores and it worked well during this second semester of 1918 and 1919 with a class of seven, including members from all of the engineering courses.

Many of the assignments are non-technical, such as discussions on engineering education, professional ethics, salaries for engineering work, the future of engineering, etc. The asking of questions and expression of personal views or statement of personal experience is encouraged. Since the instructor can not read all articles before assigning them, some points will be beyond the understanding of the students. This is well, for it often serves to show them their need of further education and experience.

The whole tendency of the course is to put the students in touch with real engineering life and develop a desire to keep up to date as well as to increase their interest in their technical studies. Incidentally, the effect on the instructor of the course is good also.

The writer does not think this course would work very satisfactorily in sections larger than about ten.

One does not want to be too hasty in discarding all the portions of a subject for which he cannot see immediate practical application. His experience may be too narrow to make him a good judge. Few engineering students know during their undergraduate days just what line of work they will follow, hence the college period is too early in life to specialize within narrow limits.

The war-time conditions of the past year and a half no doubt had a marked effect on Professor Mann and perhaps caused some modification of his report. The great emphasis placed on the idea that engineering and engineering education

exist primarily to increase industrial production, was natural at a time when so large a proportion of our engineering effort was bent on increasing production to win the war. The writer is inclined to think that engineering is also concerned with the *reason for* the desired increase in production. During the war the wish to win the war and do it quickly made quantity and speed of production of paramount importance and cost of less importance than in time of peace. The author says on page 108 of the report that "The ultimate aim of engineering education has always been and still is more intelligent industrial production." The introduction of the qualifying word "intelligent" is very important and may mean the difference between an attempt to satisfy the economic need for a certain product, and an overproduction which would result in financial failure.

But there are large fields of engineering that are not concerned with industrial production, as that term is commonly used. Among these are sanitary engineering, landscape engineering, all types of amusement engineering and flood protection. In other words engineering primarily concerned with the welfare, pleasure or safety of humanity is not for the purpose of increasing production. No doubt that since the comparatively recent boom in "safety first" much has been done in safety and welfare engineering that was intended to increase production by improving working conditions and so satisfying the employees. But would it not sound better and in fact come closer to what ought to be the truth if we say that safety and welfare engineering are primarily for the benefit of the worker and should be practiced whether or not it can be proved that the result is increased production? This ideal is more often realized by the employer in these days than it was twenty or thirty years ago when little was done in such lines except as compelled by legal enactment.

The author shows in Chapter XVI that he appreciates these types of engineering which do not aim at increased production but the writer wishes to emphasize this phase a little more. When one speaks of the ultimate aim of engineering educa-

tion, does it stretch the imagination very much to think of a time when the engineer, as well as many others will pause to inquire, "What is the increased production for"? Does it bear any resemblance to the case of the farmer who wished to "raise more crops to make more money to buy more land," etc., etc.? Are not *people* the most important product of this earth? Whatever our religion or philosophy of life (if we have any), we are *here* and is it not a worthy *ultimate* aim for us to try to make *here* a better place to live in, not merely for us but for everybody? Is it not a fact, and one for us to be proud of, that a very large percentage of engineering work does contribute directly towards making this earth a better place in which to live, even though the *immediate* aim of much of it is increased production? Even the military engineering of the United States and its allies in the great war, though it carried death to our enemies, we hope served to help make the world a better place in which to live.

This is a good time to call the attention of the engineering educators to the need of ideals which should lie back of our profession. If teachers of engineering students have no ideals or no vision beyond the immediate object of increasing industrial production, they will wake up some day to find themselves out of step with the progress of civilization and many of their former students will have outdistanced them in the matter of ideals as well as in the matter of remuneration for professional services.

A PROFESSOR'S ENGLISH.

BY P. B. McDONALD,

Assistant Professor of English, New York University.

The English used by engineering professors is probably the worst English used by teachers in this country; and the English of some contributors to ENGINEERING EDUCATION is nothing short of lamentable. At a time when the importance of English to the engineer is being emphasized in many high-sounding addresses and long-winded articles, the worst possible example is being set by the speech and writings of the engineering professors themselves. Students of engineering will never appreciate the value of good English until their teachers learn to express themselves in language suitable for a college graduate.

A teacher of engineering is supposed to think clearly, precisely, and logically. Yet, too many of them talk and write in a manner exactly the opposite. They use what Sir Arthur Quiller-Couch (Professor of English Literature in Cambridge University) calls "jargon" (page 100 of "On the Art of Writing"), of which the two main vices are "circumlocution rather than short straight speech" and the habit of "habitually choosing vague wholly abstract nouns rather than concrete ones."

The user of jargon, remarks this well-known writer, says "adverse climatic conditions" when he means "bad weather," and "in the case of John Jenkins deceased the coffin provided was of the usual character" when he means "John Jenkins' coffin was of the usual kind." He is especially addicted to such words as "case," "character," "instance," "nature," "condition," "thing," "concern," etc.

In a recent number of ENGINEERING EDUCATION a writer said: "In any complex undertaking which involves the efforts

of many individuals we acknowledge at once the value of sympathetic coöperation made effective through coördination in reaching a common goal." This is a confused roundabout way of writing quite typical of articles in ENGINEERING EDUCATION. The writer meant simply that "In complex undertakings men gain by coöperation," which is not a very startling thought, to be sure. Farther along in the same article mention was made of "syllogistic cogency." It is to be hoped that readers who read so far knew what both those words meant!

In the same BULLETIN was this muddled sentence: "During the period 1898–1900, while doing the executive work incidental to the fact that he was in charge of both the field and office work of the triangulation, precise leveling, and astronomic work of the survey, he was also active in improving methods and research work." The writer of that extraordinary conglomeration began another sentence thus: "Extensive researches by him intended to determine the reasons, etc." Truly, as a recent article on modern English in the London Times remarks, "the habit of verbosity reacts strongly upon the intelligence," and "pleonasm is the original sin of language."

To quote an American authority, the U. S. Geological Survey in its pamphlet entitled "Suggestions to Authors," says of "stilted and showy writing" (page 63): "Some members of the Geological Survey . . . never go anywhere . . . they invariably proceed. . . . Neither do they begin work; they inaugurate or initiate it." These writers, continues the pamphlet, say "superficial circulation" for "surface water," and "vegetational aspect of the vicinity," and "The high-pressure area . . . accelerates the prevalence of westerly winds." Like the love-lorn Benedick in "Much Ado About Nothing," they discard plain, honest words for a "fantastical banquet" of "strange dishes."

The Geological Survey's pamphlet suggests that such evpressions as these are over-used: "from the standpoint of," "on the basis of," "along these lines," "value," "case,"

"instance," "quite," etc. It states that too many sentences are begun with "there is," "there are," "it is;" and it prints a page of superfluous words and phrases.

These suggestions should be enough to indicate what is wrong with the English of many engineering professors, particularly of some of those who contribute to ENGINEERING EDUCATION. Another criticism likely to occur to a critical reader of the BULLETIN is the lack of moderation shown by some contributors. Their statements would be truer and more interesting if they evinced a better sense of proportion. Individual writers are too apt to think that their particular hobby is the key to the universe. Thus, one writer recently decreed that "the student who even dimly sees, or vaguely feels, the truth that engineering is the foundation of our present civilization is more apt than others to be permanently well motivated." Aside from the poor English of this sentence, there might be doubt whether or not "engineering is the foundation of our present civilization," and whether, even if it is, a student should be encouraged to get a swelled head over it. W. L. Saunders, past-president of the American Institute of Mining Engineers, has hinted that engineers lack political influence because of "megalomania." Surely then, students should not be taught to "dimly see, or vaguely feel" that the universe hinges upon them. Engineering is, of course, very important, but there have been admirable civilizations that knew very little about it. And though our modern times make tremendous use of engineering, and though it is true that the engineer is not appreciated, the world is not likely to be impressed by statements that "engineering is the foundation of our present civilization." That is, such a point of view does not tend to improve the status of the engineer. It does not show the proper balance that begets confidence. Writers of articles in ENGINEERING EDUCATION should be particularly careful neither to overstate their case nor to make it wishy-washy. To interest readers, contributions should express the truth while avoiding platitudes.

A LETTER TO THE EDITOR (THIRD WRITING).

THE EDITOR,

Sir: Since June, 1919, I have been trying to get a "letter to the editor" published. I wished to criticize the English used by some of the contributors to the BULLETIN. After long delays and several re-writings and explanations to the officials of the Society, I find my criticisms and suggestions so much discouraged by the officials of the Society that I am disinclined to re-write my letter in full again, as has been requested.

My understanding of the matter is that in criticizing the English of the BULLETIN I must not cite specific instances, since that would be "too personal." Therefore, I would merely suggest that the English used by some of the contributors is exceptionally bad, and that it sets a poor example to students of engineering.

P. B. MCDONALD.

NEW YORK,
November 12, 1919.

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EDITORIAL.

Are there Enough Engineering Schools?—The demand for engineering graduates has become so pressing in the industries that the question naturally arises: is there a sufficient number of engineering schools in this country to provide a constant adequate supply of technically trained men for the industries? I believe there is not.

With the constantly increasing foreign trade which the United States is developing, the demand for different manufactured products must of necessity increase. The success of this foreign trade is dependent upon the constructive genius in industry to design and originate articles which the production and selling organizations place upon the market. Without the developed constructive organization in the industries, our foreign trade must fail. We have come to look upon Germany as possessing all the characteristics of a nation which we should avoid, but one thing is certain that its great success in foreign trade was due to the large number of highly trained specialists who worked in the industries.

Our manufacturers are recognizing more fully the advantages which arise from a technical staff composed of properly trained men. This recognition of the phase of applied science in industry is to increase in the future. Can our schools take care of this increased demand? I do not believe they can.

Not only should the capacity of the engineering schools as they exist to-day be greatly increased, but the number of such schools should also be increased. The question whether or not proper instruction in engineering can be given to large numbers should be thoroughly discussed. Can one thousand freshmen be given proper instruction in fundamentals which will lay a broad foundation for their later specialized training in applied science? Are there a sufficient number of trained teachers available for this work? If not, where in this country are we to secure such teachers? The answers to these questions, it seems to me, control industry in the United States.

COLLEGE NOTES.

University of Michigan Highway Engineering and Highway Transport.

PERIODS AND FEES FOR GRADUATE COURSES, DECEMBER 1, 1919, TO MARCH 19, 1920.

Civil Engineering 67. Highway Transport. Professor Blanchard. February 2 to 6, Monday to Friday, 1:30 to 4:30 P.M. 1 hour credit.

Civil Engineering 68. Bituminous Surfaces and Bituminous Pavements. Professor Blanchard. December 1 to 19, Mondays to Fridays, 1:30 to 4:30 P.M. 3 hours credit.

Civil Engineering 69. Highway Laboratory Research. Professor Bateman. January 5 to 23, Mondays to Fridays, 10 A.M. to 12 M. and 1:00 to 5:00 P.M. 2 to 3 hours credit, dependent upon a student's previous training in highway laboratory methods.

Civil Engineering 70. Highway Bridges. Professor Gram. February 9 to 20, Mondays and Fridays, 1:30 to 4:30 P.M. 2 hours credit.

Civil Engineering 71. Specifications and Contracts. Professor Riggs. February 9 to 20, Mondays to Fridays, 1:30 to 4:30 P.M. 2 hours credit.

Civil Engineering 72. Earth, Gravel and Broken Stone Roads. Professor Bateman. March 1 to 12, Mondays to Fridays, 1:30 to 4:30 P.M. 2 hours credit.

Civil Engineering 73. Cement-Concrete Pavements. Professor Blanchard. March 1 to 9, Mondays to Fridays, 1:30 to 4:30 P.M. 1 hour credit.

Civil Engineering 74. Brick Pavements. Professor Blanchard. March 11 to 19, Mondays to Fridays, 1:30 to 4:00 P.M. 1 hour credit.

Civil Engineering 75. Highway Engineering Seminar. Professor Blanchard. December 1 to March 19. 3 hours credit.

Fees: The fees for courses are based on the number of credit hours for each course. The fee for each credit hour is five dollars.

For further information pertaining to the short-period graduate courses, write to Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan, Ann Arbor, Mich.

University of Southern California.—The first unit, an administration building to cost approximately half a million dollars, in the announced plans of the University of Southern California is in process of erection, the corner stone having been laid on Oct. 14.

The enrollment is the largest in the history of the institution, and approximates the total enrollment of last year which was more than four thousand. The enrollment in freshmen engineering courses is particularly heavy, being nearly twice that of last year.

The quarters of the civil engineering department have been remodeled and enlarged. Professor C. W. Lawrence is in charge.

The course in electrical engineering has been completely revised and a four year course in mechanical engineering added. These courses will be conducted on a modified cooperative plan under which a minimum of twenty-four weeks actual employment in commercial work will be prerequisite for graduation. This experience will be obtained during the summer vacations. The electric companies and manufacturing interests of Los Angeles are coöperating with the University in this work, which is in charge of Professor J. Fay Wilson. In connection with the revision of the courses, the laboratory equipment is being materially augmented.

Professor A. W. Nye, who was absent on war work during the past year, has returned and resumed charge of the department of physics.

COMMITTEE NO. 22, INTELLIGENCE TESTS.

You will be interested to know that the following engineering colleges are participating in the coöperative study of entrance tests:

University of Akron.
Alabama Polytechnic Institute.
University of Alabama.
University of Arkansas.
University of California.
Carnegie Inst. of Technology.
Case School of Applied Science.
Columbia University.
Cornell University.
The Drexel Institute.
University of Idaho.
Iowa State College, Ames, Ia.
State Univ. of Iowa, Iowa City.
Johns Hopkins University.
Kan. State Agric. College.
University of Kansas.
Lafayette College.
McGill University, Montreal.
University of Maine.
Marquette University.
Michigan Agric. College.
University of Michigan.
University of Missouri (School of Mines).
University of Missouri (School of Engineering).
University of Montana.
New Mexico College of Agric. & Mechanic Arts.
New York University.
University of Nevada.
Ohio State University.
Okla. Agric. & Mechanical College.
University of Oklahoma.
University of Penna.
Purdue University.
Rensselaer Polytechnic Institute.
Rhode Island State College.
Rose Polytechnic Institute.
State Civil Service Commission of Ohio.
Syracuse University.
University of Texas.
Throop College of Technology.
Tufts College.
Vanderbilt University.
University of Vermont.
University of Virginia.
Warner & Swasey Co.
University of Washington, Seattle.
University of Wisconsin.
Worcester Polytechnic Institute.

APPOINTMENTS BY THE PRESIDENT.

Professor H. E. T. Haultain, University of Toronto, has been appointed a member of Committee No. 18, Mining Engineering.

Professor H. H. Higbie and Dean M. E. Cooley were appointed to represent the Society at the Interprofessional Conference in Detroit, Mich., November 28–29.

President A. M. Greene, Jr., will represent the Society at the annual meeting of the American Society of Mechanical Engineers in New York, December 3–5.

NEW MEMBERS.

ALLEN, FREDERICK G., Assistant Professor of Electrical Engineering, Lafayette College, Easton, Pa.

ARCHIBALD, LEON, Instructor in Drawing and Descriptive Geometry, University of Minnesota, Minneapolis, Minn.

CALDERWOOD, JAS. P., Professor of Steam and Gas Engineering, The Kansas State Agricultural College, Manhattan, Kans.

CAMPBELL, MALCOLM, M., Supervising Engineer, P. O. Box 385, Montreal.

COLER, CARL S., Manager, Educational Department, Westinghouse E. & M. Co., East Pittsburgh, Pa.

DRANE, WALTER H., Professor of Civil Engineering, University of Florida, Gainesville, Fla.

FENTON, HENRY H., Assistant Professor of Electrical Engineering, Kansas State Agricultural College, Manhattan, Kans.

GILBERT, EARL R., Associate in Drawing, Technological High School, Atlanta, Ga.

GRANDLIENARD, EDWARD T., Assistant Professor of Civil Engineering, University of Pennsylvania, Philadelphia, Pa.

MCNEILLY, ROBERT H., Associate Professor of Civil Engineering, Vanderbilt University, Nashville, Tenn.

MACK, ALBERT J., Instructor in Steam and Gas Engineering, Kansas State Agricultural College, Manhattan, Kans.

RATH, EDWIN R., Instructor in Electrical Engineering, University of Pittsburgh, Pittsburgh, Pa.

ROARK, RAYMOND J., Associate Professor of Mechanics and Hydraulics, State University of Iowa, Iowa City, Iowa.

WILMOT, SYDNEY, Assistant Professor of Civil Engineering, Brown University, Providence, R. I.

SECTIONS OF THE SOCIETY.

The first section of the Society to be approved by the Council is the Pittsburgh Section. The organization meeting was held October 17, 1919, at the University Club, with twelve members of the Society present. This meeting was called by Dean W. E. Mott, Carnegie Institute of Technology, and Dean F. L. Bishop, University of Pittsburgh. Plans for 1919–20 were considered at this time and committees appointed. Professor P. M. Dysart of Schenley High School, was elected Chairman, and Professor L. H. Harris of the University of Pittsburgh, Secretary. The next meeting of this Section will be held Wednesday, December 3, at which time the following program will be offered:

General Topic: "What Are the Chief Defects in the Product of Engineering Schools?"

Speakers: B. F. Groat, Aluminum Company of America; D. F. Crawford, Locomotive Stoker Company; Carl S. Coler, Westinghouse E. & M. Company.

Special Discussion:

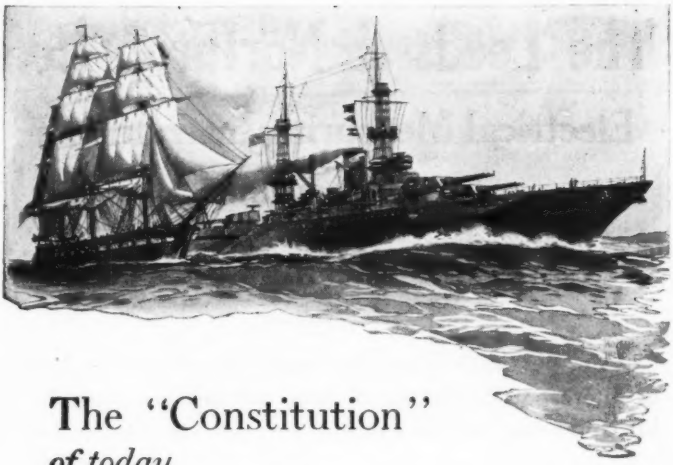
"What Defects Are Properly Chargeable to the Engineering Schools?" F. L. Bishop, Dean, School of Engineering, University of Pittsburgh.

"What Defects Can the School Hope to Remedy?" W. E. Mott, Dean, School of Applied Science, Carnegie Institute of Technology.

JOINT MEETING OF THE SOCIETY WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Society for the Promotion of Engineering Education is an affiliated society of the American Association for the Advancement of Science and as such will hold a meeting with Section D, Engineering, on January 1, 1920. This meeting will be held in the Soldan High School, located at the corner of Union Boulevard and Kensington Avenue, 5300 west.

The meeting of the Association will be held from December 29, 1919, to January 3, 1920. The meetings of Section D, Engineering, will be held December 31, 1919, and January 1, 1920. Dean A. S. Langsdorf, of Washington University, will have charge of the arrangements for the meetings of Section D. President Ira N. Hollis, Worcester Polytechnic Institute is Chairman of Section D, and Dean F. L. Bishop, University of Pittsburgh, Secretary. An interesting program has been arranged.



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The Bulletin of the Society for the Promotion of Engineering Education

PUBLICATION COMMITTEE
John F. Hayford, Milo S. Ketchum, F. L. Bishop

The Bulletin is the official organ of the Society. It is published monthly from September to June. It contains not only the text of papers presented before the Society, but also college notes, short contributions from members, and matters of general interest to all persons connected directly or indirectly with technical education.

The Society comprises about fifteen hundred teachers, engineers and other persons interested in technical education and a considerable number of educational institutions.

Subscription Price

The membership fee includes one subscription to the Bulletin. To non-members and libraries, the price of the Bulletin is $2.00 per year. Libraries may subscribe for the Bulletin and Proceedings for $4.00 per year.

Communications regarding subscriptions, advertising and editorial matter should be addressed to **The Bulletin of the Society for the Promotion of Engineering Education, 41 North Queen Street, Lancaster, Pa., or to the Editor, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.** Remittances should be drawn to the order of **Mr. W. O. WILEY, Treasurer, 432 Fourth Avenue, New York.**

New Van Nostrand Books

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Professor of Mathematics and Engineering in the Citadel, the Military College of South Carolina.

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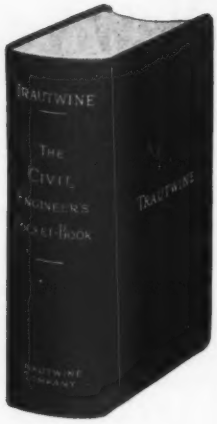

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